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Enhancing Weak Field Atomic Excitation Using an Atomic Array TAYLOR PATTI, DOMINIK WILD, MIKHAIL LUKIN, Harvard University, SUSANNE YELIN, Harvard University, University of Connecticut — We examine a mechanism by which the steady-state excitation likelihood of a single target atom in a weak driving field can be enhanced by many orders of magnitude via interaction with a proximal atomic square lattice. This enhancement is highly sensitive to relative atomic linewidth, polarization, and detuning between the impurity atom of interest and those of the array, and can be conceptualized as impurity interaction with array band structure and collective decay modes. Moreover, it is closely correlated with enhanced scattering in the system. In the case of an infinite lattice, we introduce these interactions in terms of the impurity's self-induced energy and Rabi drive, which stem from its interaction with lattice normal modes. In the case of few atoms, we examine the system in the framework of an optical dark state with properties stemming from geometrical symmetry.

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